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10/775,849	02/09/2004	Haixin Yang	EL0543USNA	1160

23906 7590 11/06/2007

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EXAMINER	
MAYES, MELVIN C	
ART UNIT	**PAPER NUMBER**
1791	

NOTIFICATION DATE	DELIVERY MODE
11/06/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-Legal.PRC@usa.dupont.com

Office Action Summary	Application No.	Applicant(s)	
	10/775,849	YANG, HAIXIN	
	Examiner	Art Unit	
	Melvin Curtis Mayes	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

(1)

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

(2)

Claims 12 and 31 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the concentration of UV-curable compounds being 1-10wt% based on the weight of the composition, does not reasonably provide enablement for the concentration based on the weight of the functional material. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

According to the specification, the concentration of UV-curable compound is 1-10 wt% based on the total weight of the conductor composition (pg. 8, line 5), not based on the total weight of the functional material, as claimed.

(3)

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

(4)

Claims 18, 19, 26, 37 and 38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 claims "composition of Claim 1" but Claim 1 is directed to a method.

Claims 18 and 37 recite the limitation "the fired lines." There is insufficient antecedent basis for this limitation in the claim.

Claims 19 and 38 recite the limitation "the fired line." There is insufficient antecedent basis for this limitation in the claim.

Claim 26 claims that the substrate can be plastic but depends from Claim 20 which claims "firing said substrate..." The process of "firing" is conventionally associated with glass and ceramic materials, not plastics which do not fire (or sinter) but melt or burn upon heating. It is not clear how a plastic substrate can be a type of substrate that undergoes the step of "firing said substrate and ink composition" as claimed in Claim 20.

Claim Rejections - 35 USC § 102 and 103

(5)

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

(6)

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(7)

Claims 1, 3-6, 13 and 16-18 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Pan et al. 7,062,848.

Pan et al. disclose a method of producing conductive paths on t substrate comprising:

applying a composition by ink-jetting to a substrate such as a glass substrate, ceramic substrate or polymeric, the composition comprising: (1) nanostructure material comprising nanoparticles of conductive material coated with (2) surfactant such as polyvinylpyrrolidone; dispersed in (3) dispersion vehicle such as water and solvent,

wherein the viscosity of the composition is 0.8 – 20 cP (0.8-20 mPa.s) for thermal ink-jet systems and 2-15 cP (2-15 mPa.s) for piezoelectric ink-jet systems; and

heating to form the conductive feature, the heating including sintering the nanoparticles, at 150°C to 900°C depending on the specific nanostructure material (col. 2-14).

Further, by providing the nanoparticles as coated with polyvinylpyrrolidone, the composition obviously comprises polyvinylpyrrolidone dispersed a dispersion vehicle of solvent or mixture with water, as claimed.

Regarding Claim 13, the nanoparticles have size of 0.1 nm - about 100 nm (overlapping the claimed range of 0.1 μm – 1.2 μm).

Regarding Claims 5, 6, 16, the nanoparticles can be of copper, silver, gold, cobalt, platinum, palladium, nickel or combinations thereof (col. 4, lines 51-54).

Regarding Claims 17 and 18, the linewidth can be from 0.1 μm up to any practical width such as up to 500 μm (encompassing the claimed range of 100 μm - 165 μm) and the depth (thickness) is from 0.1 μm to 20 μm for most electronic devices (encompassing the claimed range of 1.8 μm - 2.0 μm) (col. 12, lines 35-65).

(8)

Claims 1 and 3-19 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kodas et al. 2003/0148024.

Kodas et al. disclose a method of making conductive electronic features comprising:

applying a composition by ink jet printing to a substrate such as a glass substrate, ceramic substrate or polymeric, the composition comprising: (1) molecular metal precursors and micron-sized metal particles, (2) nanoparticles coated with coating such as polyvinyl pyrrolidone; dispersed in (3) solvent by itself or with water,

wherein the viscosity of the composition is not greater than 1000 cP, preferably not greater than 50 cP for ink jet printing (50 mPa.s); and

heating to form the conductive feature, the heating including sintering the particles or the precursor [0018]-[0280].

Further, by providing the nanoparticles as coated with polyvinyl pyrrolidone, the composition obviously comprises polyvinylpyrrolidone dispersed a dispersion vehicle of solvent or mixture with water, as claimed.

Further by sintering the particles or the precursor, a step of firing the substrate and ink composition is obviously performed.

Regarding Claim 3, the viscosity for ink jet printing is in the range of 10-40 cP (10-40 mPa.s) [0220].

Regarding Claims 5, 6, 16, the molecular metal precursors can be silver, copper, silver and palladium, platinum, gold or nickel and the micron-sized particles and the nanoparticles can be silver, palladium, copper, gold, platinum and nickel [0030][0031], [0257]-[0263].

Regarding Claims 7 and 9, surfactants can be used to modify the compositions and substrates to achieve the values of surface tensions and interfacial energies required [0191].

Regarding Claim 8, the surface tension of the composition is chosen to be 5,10, 15, 20 or 25 dynes/cm greater than that of the substrate, ink jet heads require surface tensions of 20-50 dynes/cm depending on the type of ink jet head, most electrical substrates have surface tension values in the range of 18 to 45 and glass has a surface tension of 30 dynes/cm [0184]-[0186], [0194].

Regarding Claims 10-12 , the composition can include a monomer curable by thermal or UV means and immediately exposed after deposition to polymerize and thicken and reduce spreading of the composition [0160], [0239].

Regarding Claims 13-15, the micron-sized particles have media particle size of at least 0.1 μm but preferably not greater than 20 μm [0032].

Regarding Claims 17, the conductive features have average width not greater than 250 μm [0279] (encompassing the claimed range of 100 μm - 165 μm).

Regarding Claim 18, the conductive feature can have an average thickness of greater than 0.01 μm, even greater than 1 μm [0276] (encompassing the claimed range of 1.8 μm - 2.0 μm).

Regarding Claim 19, the resistivity of the conductive features is not greater than 20 times the resistivity of the bulk conductor [0021].

(9)

Claims 20-38 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Kodas et al. 2003/0148024.

Kodas et al. disclose a method of making conductive electronic features comprising:

applying a composition by ink jet printing to a substrate treated with surfactant to achieve the values of surface tension and interfacial energy required, the composition comprising: (1) molecular metal precursors and micron-sized metal particles, (2) nanoparticles coated with coating such as polyvinyl pyrrolidone; dispersed in (3) solvent by itself or with water,

wherein the viscosity of the composition is not greater than 1000 cP, preferably not greater than 50 cP for ink jet printing (50 mPa.s); and

heating to from the conductive feature including sintering (firing) [0018]-[0280].

Further, by providing the nanoparticles as coated with polyvinyl pyrrolidone, the composition obviously comprises polyvinylpyrrolidone dispersed a dispersion vehicle of solvent or mixture with water, as claimed.

Further by sintering the particles or the precursor, a step of firing the substrate and ink composition is obviously performed.

Regarding Claim 21, the viscosity for ink jet printing is in the range of 10-40 cP (10-40 mPa.s) [0220].

Regarding Claims 23, 24 and 35, the molecular metal precursors can be silver, copper, silver and palladium, platinum, gold or nickel and the micron-sized particles and the nanoparticles can be silver, palladium, copper, gold, platinum and nickel [0030][0031], [0257]-[0263].

Regarding Claim 26, the substrate can be glass, ceramic or polymeric [0156].

Regarding Claim 27, the surface tension of the composition is chosen to be 5,10, 15, 20 or 25 dynes/cm greater than that of the substrate, ink jet heads require surface tensions of 20-50 dynes/cm depending on the type of ink jet head, most electrical substrates have surface tension values in the range of 18 to 45 and glass has a surface tension of 30 dynes/cm [0184]-[0186], [0194].

Regarding Claims 29-31, the composition can include a monomer curable by thermal or UV means and immediately exposed after deposition to polymerize and thicken and reduce spreading of the composition [0160], [0239].

Regarding Claims 32-34, the micron-sized particles have media particle size of at least 0.1 μm but preferably not greater than 20 μm [0032].

Regarding Claims 36, the conductive features have average width not greater than 250 μm [0279].

Regarding Claim 37, the conductive feature can have an average thickness of greater than 0.01 μm, even greater than 1 μm [0276].

Regarding Claim 38, the resistivity of the conductive features is not greater than 20 times the resistivity of the bulk conductor [0021].

(10)

Claims 1, 3-6, 10-12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bishop 5,744,245 in view of Kodas et al. 2003/0148024.

Bishop discloses a method of forming electrically conductive pathways on insulating materials such as ceramic or glass substrates comprising:

applying a composition by ink jet printing to a substrate such as a glass substrate, the composition comprising: (1) a thiolate of precious metal (functional material of compound having electrical properties), (2) polymeric resin preferably such as polyvinyl pyrrolidone dispersed in (3) water and a co-solvent; and

firing the composition (col. 1-10). Bishop does not disclose the viscosity of the composition for ink jet printing. Bishop does not disclose the viscosity of the composition.

Kodas et al. teach that compositions of metal precursor for forming conductive features on substrates by ink jet printing should have a viscosity not greater than 50 cP such as in the range of 10-40 cP for use in an ink jet [0220].

It would have been obvious to one of ordinary skill in the art to have modified the method of Bishop by providing the composition of viscosity not greater than 50 cP such as in the range of 10-40 cP, within the claimed range of 5-50 mPa.s and overlapping the claimed range of

less than 20 mPa.s, as taught by Kodas et al., as viscosity for composition of metal precursor for forming conductive features by ink jet printing.

Regarding Claims 5, 6 and 16 , Bishop discloses that the precious metal can be platinum, palladium, gold and/or silver (col. 1, lines 54-67).

Regarding Claims 10-12, Bishop discloses that the composition may be UV-curable by reason of the polymeric resin being UV-curable or thermally curable by reason of the polymeric resin being thermosetting (col. 9, liens 43-46), thus obviously comprising a UV-curable or thermally curable compound. Bishop discloses that the composition can comprise less than 5% of the resin but usually contains 5-45% (col. 8, lines 21-23), thus overlapping or encompassing 1-10wt% UV-curable compound as claimed in Claim 12.

Response to Arguments

(11)

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Further, Applicant argues that polyvinylpyrrolidone has been specifically identified as a binder that is a most effective organic polymer for dispersing functional materials; however the claims are not limited to using polyvinylpyrrolidone as organic binder for dispersing the functional material. The claims only require that polyvinylpyrrolidone be present in the composition as dispersed in dispersion vehicle. The references now applied each provide a composition having polyvinylpyrrolidone dispersed in dispersion vehicle, the composition applied to a glass substrate or treated substrate.

Conclusion

(12)

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 571-272-1234. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Phillip C. Tucker can be reached on 571-272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Melvin Curtis Mayes
Primary Examiner
Art Unit 1791

MCM
November 1, 2007